TILLSONBURG water pollution control plant

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NOV 25 1965

OLI RIU WATER

DIVISION OF PLANT OPERATIONS

Ontario Water Resources Commission

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ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Tillsonburg Local Advisory Committee, Town of Tillsonburg.

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for the Tillsonburg Water Pollution Control Plant, OWRC Project No. 58-S-12.

By continuing the mutual cooperation which has existed in the past, we can look forward to greater progress in the field of water pollution control.

Yours very truly,

General Manager



General Manager, Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Tillsonburg Water Pollution Control Plant, OWRC Project No. 58-S-12 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B. C. Palmer, P. Eng.,

BCP almer

Director,

Division of Plant Operations.

FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng., Director, Division of Plant Operations.

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TILLSONBURG pollution control plant water

operated for

THE TOWN OF TILLSONBURG

by the

ONTARIO WATER RESOURCES COMMISSION

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DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry Regional Supervisor: A. Beattie

Operations Engineer: P. J. Osmond

801 Bay Street

Toronto 5

64 REVIEW

This report gives in detail significant data on the operation of the various treatment units at the Tillsonburg Water Pollution Control Plant during 1964.

The average flow treated at the plant during the year was 512,000 gallons per day which was 77% of the design capacity of the plant. This represents an 8.0% increase in flow over 1963. During the peak month of December the average daily flow was 85% of the design capacity. This indicates that the flow to the plant is approaching the design capacity.

A raw sewage having an average strength of 212 ppm BOD and 231 ppm SS was treated. Good removals were obtained by the plant resulting in a 95.0% reduction in BOD and a 94.0% reduction in SS. A total of 189.0 tons of BOD and 201.4 tons of SS was removed. A total of 501,000 cu. ft. of raw sludge was treated by the digester and 98,080 cu. ft. of digested sludge was hauled by truck. A proper chlorination of the final effluent was maintained from May to October.

Inspections of the structures and grounds showed that they were well maintained and in good condition. An electrical and mechanical inspection was made of the project equipment and no major deficiencies were discovered. A total of 68 hours was spent by the OWRC head office technicians at the project.

The operating cost for the year was \$21,844.08 which was a slight increase over the cost of \$19,753.04 in 1963. The cost per million gallons treated was \$116.50 as compared to \$114.20 in 1963.

GLOSSARY

BOD biochemical oxygen demand (a measure of organic

content)

cfm cubic feet per minute

comminution shredding of solids into small fragments

DWF dry weather flow

effluent outflow

flocculation bringing very small particles together to form a larger

mass (the floc) before settling

fps feet per second

gpcd gallons per capita per day

gpm gallons per minute

grit sand, dust, stones, cinders and other heavy inorganic

material

influent inflow

lin. ft. lineal feet

mgd million gallons per day

mlss mixed liquor suspended solids

ppm parts per million

ss suspended solids

TDH total dynamic head (usually refers to pressure on a pump

when it is in operation)



INCEP TION

The Town of Tillsonburg approached the Ontario Water Resources Commission to undertake the financing, construction and operation of a new water pollution control plant.

The firm of R. V. Anderson and Associates, Toronto Ontario, Consulting Engineers, was engaged to prepare plans and specifications for the project.

CONSTRUCTION

Construction began in December 1958. Schwenger Construction Company Limited, Burlington, constructed the plant and pumping station with associated equipment and appurtenances. W. A. Haggerty Construction Limited constructed the forcemain and sanitary sewers. In February 1961 the Division of Plant Operations of the Commission took over the operation of this new project.

TOTAL COST

The total cost of the project was \$606, 243.43.

Project Staff

Chief Operator - J. H. Allin

Operator - W. D. Ronson

COMMENTS

The Tillsonburg Water Pollution Control Plant has a staff of two, a Chief Operator and an operator. An 8 hour per day supervision is given during the week and a partial coverage is given both on Saturday and Sunday.

Both members of the staff have attended a series of three courses sponsored by the Ontario Water Resources Commission and have received a Certificate of Qualification as Sewage Works Operators

Description of Project

INFLUENT WORKS

The plant flow enters an influent chamber via a 12 inch diameter forcemain from the John Pound Street Pumping Station and a 15 inch diameter gravity sewer. The influent chamber is equipped with an adjustable bypass weir.

From the influent chamber the flow passes through a barminutor which continuously screens and cuts the coarse material in the sewage without removing it from the flow. A bypass screen is also provided in case the barminutor breaks down.

The flow then passes through an Aerdegritter which removes the sand and grit and allows the organic material to remain in suspension.

PRIMARY SEDIMENTATION

Two rectangular settling tanks receive the sewage from the grit removal unit. Approximately 50% of the suspended solids in the incoming sewage settles to the bottom of the tanks.

A set of flight collectors moves the sludge on the bottom to one end of the tank where it is drawn off into a hopper. The flights also skim the surface and remove floating material which is also put into the hopper. The contents of the hopper are then pumped into the digester and the settled sewage flows over the weirs to the aeration tanks.

AERATION SECTION

The effluent from the primary tanks flows

into two single pass aeration tanks where it is mixed with the activated sludge returned from the final settling tanks. The mixture is aerated for a period of 10.1 hours at design flow. The two tanks allow for some flexibility in the method of their operation. The air is supplied by two blowers located in the control building to the headers located at the bottom of the tank. The headers are equipped with Sparjer air diffusers.

FINAL SEDIMENTATION

The aerated mixed liquor from the aeration tanks is retained in two rectangular tanks for a period of 2.8 hours at design flow. This allows the activated sludge to settle and it is collected and returned to the aeration section or wasted. (Excess activated sludge is returned or "wasted" to the primary tanks where it settles and is pumped to the digester). The remaining liquid flows over the weirs of the final tanks, is chlorinated in the chlorine contact chamber, and then flows to the creek.

SLUDGE DIGESTION

The Tillsonburg plant utilizes a single stage digester. The tank is 45 feet in diameter and has a floating cover. The sludge from the digester is pumped through a heat exchanger and recirculated back to the digester in order to maintain a temperature of approximately 90°F, where in the absence of air the decomposing or digestion process takes place. The sludge is broken down by bacterial action to a thick, black, odorless liquid. Digested sludge is hauled away from the digester by tank truck.

PROJECT COSTS

LONG TERM	M DEBT:
(Total	Capital Cost)

\$608,020.00

The total cost to the municipality during 1964 was as follows:

Interest Charged	34, 162, 41
Reserve Interest Charged	4, 203, 00 34, 162, 41
Debt Retirement	12,270.00
Net Operating	\$ 21,844.08

RESERVE ACCOUNT

Balance at January 1, 1964 Deposited by Municipality Interest Earned	\$ 11,958.50 4,203.00 747.78
	\$ 16,909.28
Less Expenditures	-
Balance at December 31, 1964	\$ 16,909.28
DEBT OUTSTANDING:	\$568,249.65

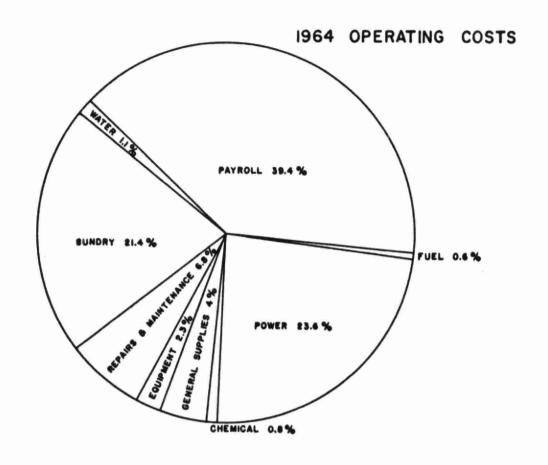
MONTHLY COSTS

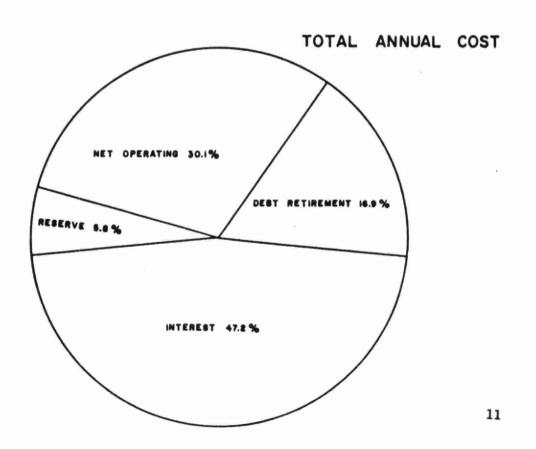
MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS B MAINTENANCE	* SUNDRY	WATER
JAN	1379.09	632,96			499.04		7,60			218,69	20,80
FEB	2063.07	•32. 96			374.34		122,68		194,23	725.49	13.37
MARCH	1531.50	703,62		134.13	362,57		128.55	7.84	125,94	48,65	20,20
APRIL	1372,57	657.32			351,28		83,52		72.22	180,90	27,33
MAY	1783,23	985,98			319,37		102.97		117,36	241.80	15.75
JUNE	1867.72	728.96			388.84		74,82	102.27	63,82	489,99	19.02
JULY	2392,29	657,32			430,52	574,02	50.26	160.11	81.87	417.69	20.50
AUG	1982,82	657.32			441,33		4,58	104,75	440.62	315.80	18.42
SEPT	2184,23	657.32			475,75	434,02	53 .7 3	94.76	29.93	404.25	34.47
ост	1619,68	657.32			408.13		105.87		1.31	430.11	16,94
NOV	1555,16	657,32			365.00		34,84	1.18	183.39	305.73	7.70
DEC	2112.72	985,98			741.72	84 0. 00 CR	110,62	35,04	171.00	892.96	15.40
TOTAL	21844.08	86 4,38		134,13	5157.89	168.04	880.04	505.95	1481.69	4672 .0 6	229,90

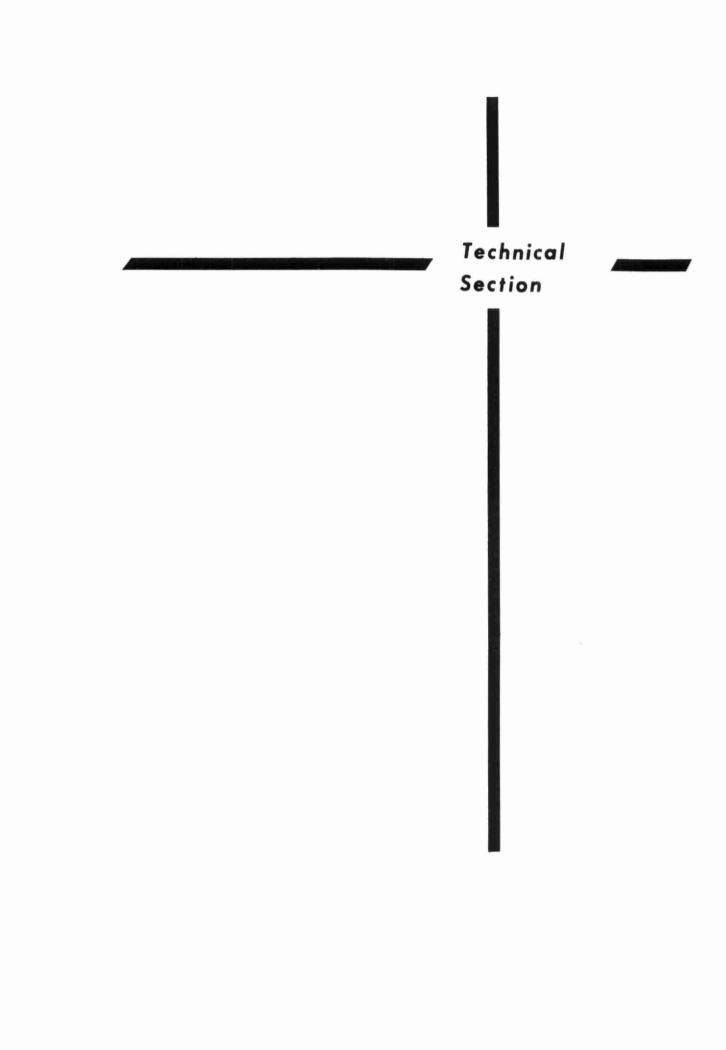
^{*} SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE \$4341.82
BRACKETS INDICATE CREDIT

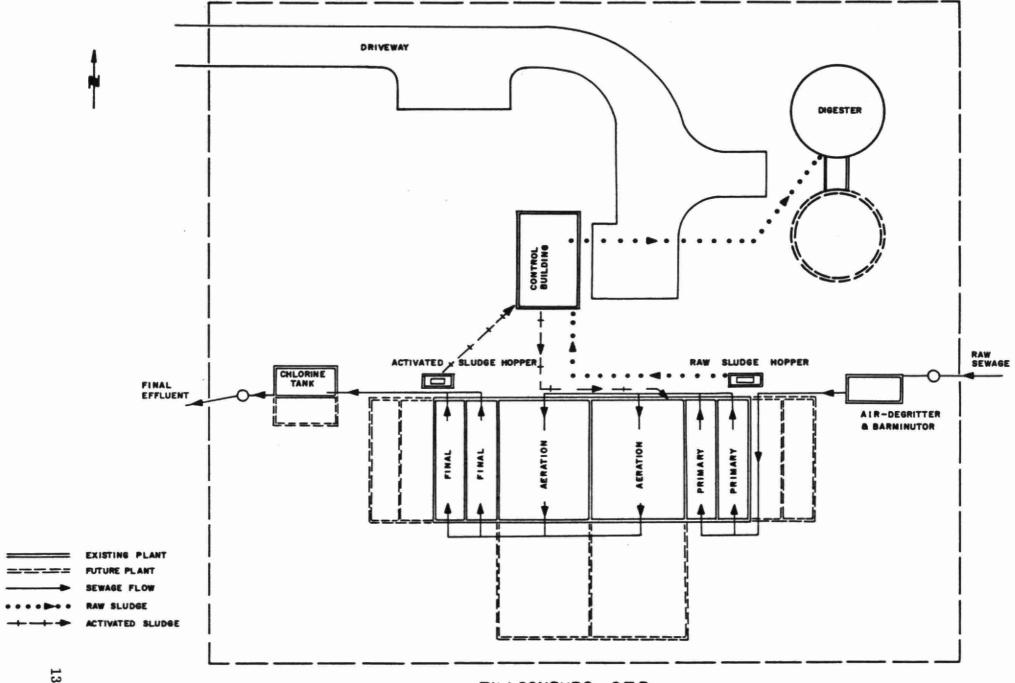
YEARLY COSTS

YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1963	173,024	\$19,753.04	\$11,66	\$114.20	5 CENTS
1964	187 . 461	\$21,844.08	\$11.35	\$116.50	6 CENTS









Design-Data

JOHN POUND STREET PUMPING STATION

No. 1 - Chicago Pump Company - capacity 458 gpm @ 26.5 TDH 7 1/2 HP motor.

No. 2 - Chicago Pump Company - capa-,city 687 gpm @ 29.5 TDH 10 HP motor.

No. 3 - Chicago Pump Company - capacity 917 gpm @ 33.5 TDH 15 HP motor.

COMMINUTION

One 18" Chicago Pump Barminutor Type "B". Also a bypass channel with bar screen.

TREATMENT PLANT

Type of Plant - Activated sludge.

Design Population - 7,000 persons.

<u>Design Plant Flow</u> - 665,000 gallons per day.

Per Capita Flow - 95 gallons.

Five Day BOD -

Raw Sewage - 235 PPM

Removal - 95%

Suspended Solids -

Raw Sewage - 250 PPM

Removal - 95%

PRIMARY TREATMENT

Influent Sewer

12" forcemain from John Pound Street Pumping Station.

15" gravity sewer from the east side of town.

Comminution

One 18" Chicago Pump Barminutor - Type "C".

Also a bypass channel with bar screen.

Grit Removal

Chicago Pump Aer-degritter with dimensions of 13 ft. by 6 ft. by 8 ft. The volume is 3,900 gallons and at design flow has a detention period of 8.4 minutes.

The unit has a maximum capacity of 4.0 MGD.

The cross velocities at the bottom of the tank are approximately 2.0 feet per second.

PRIMARY SEDIMENTATION TANKS

Two rectangular units.

Each tank is 50 ft. 4 in by 10 ft. by 8 ft. for a combined volume of 50,300 gallons giving a detention time of 1.82 hours at design flow. The sludge is collected by Jeffrey flight collectors.

Raw Sludge pumps_

One Chicago Pump, Scru-Flow pump with

a capacity of 125 gpm @ 90 ft. TDH with a 7 1/2 HP motor.

One standby sludge pump, Wemco, Torque-flow with a capacity of 125 gpm @ 65 ft. TDH with a 10 HP motor.

SECONDARY TREATMENT

Aeration Tanks

Two single pass rectangular aeration tanks each 50 ft. by 30 ft. by 13 ft. for a combined volume of 281,000 gallons. Detention time of 10.1 hours at design flow.

Air Supply

Two 24 ft. headers in each tank. Fourteen Walker Process Diffuser Sparjers per header for a total of twenty-eight sparjers per tank. Two Roots-Connersville 816 Blowers, each having a capacity of 875 cfm @ 7.5 psig. Each blower is driven by a 40 HP motor.

FINAL SEDIMENTATION

Two rectangular units each 50ft. 4 in. by 10 ft. by 12 ft. 3 in. having a combined volume of 77,000 gallons giving a detention period of 2.8 hours at design flow. The sludge is collected by Jeffrey Flight collectors.

Return Sludge Pumps

Two Smart-Turner centrifugal pumps, each having a capacity of 250 gpm @ 25 TDH. Each pump is driven by a 3 HP U.S. Vari-Drive motor.

DIGESTER

One circular tank 45 ft. diameter by 22 ft. 4 in. SWD with a Chicago Pump Company Pontoon type floating cover. (Maximum liquid height 20 ft. 1 in. at side wall and 26 ft. 7 in. at centre). Volume of digester is 36,000 cu. ft.

Heat Exchanger

One Pacific Flush Tank Company heat exchanger operating on sewage gas or fuel oil to heat the sludge.
Rated capacity is 375,000 BTU/hour.

CHLORINATION

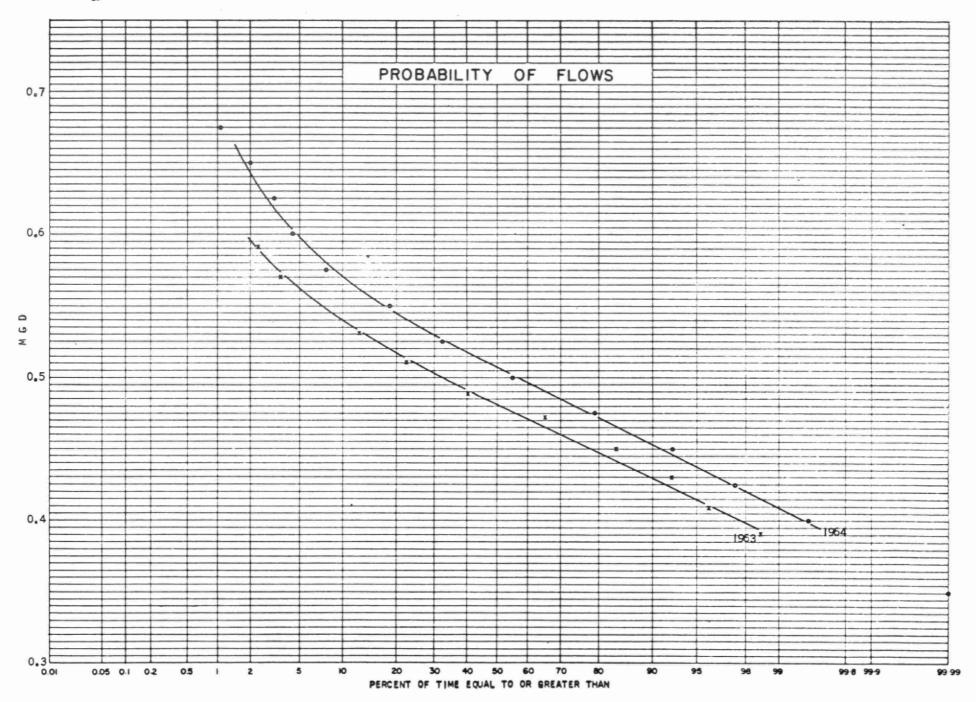
Chlorine contact chamber 20 ft. by 11 ft. 3 in. by 9 ft. 9 in. having a volume of 13,950 gallons, giving a contact period of 30.2 minutes at design flow. One Wallace and Tiernan, Series A-731, V-Notch chlorinator with a capacity of 400 lbs/day.

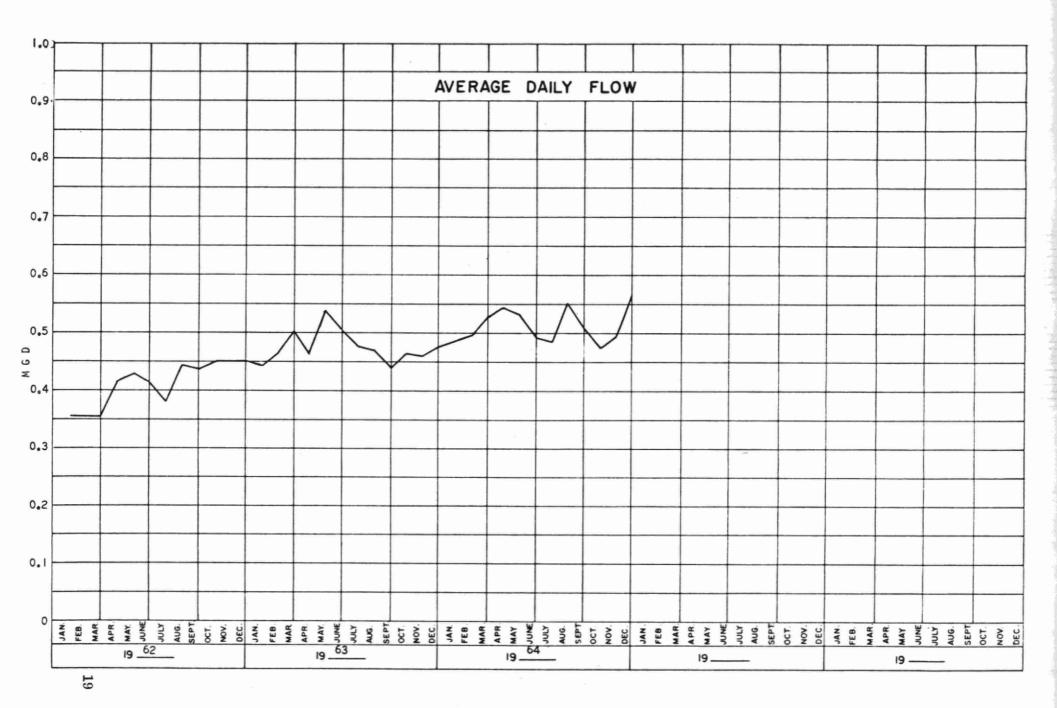
Flow Measurement

The flow is measured by a Foxboro flow meter, which records, indicates and integrates the flow passing through a 9 in. Parshall flume. It also provides automatic control of the chlorinator.

Process Data

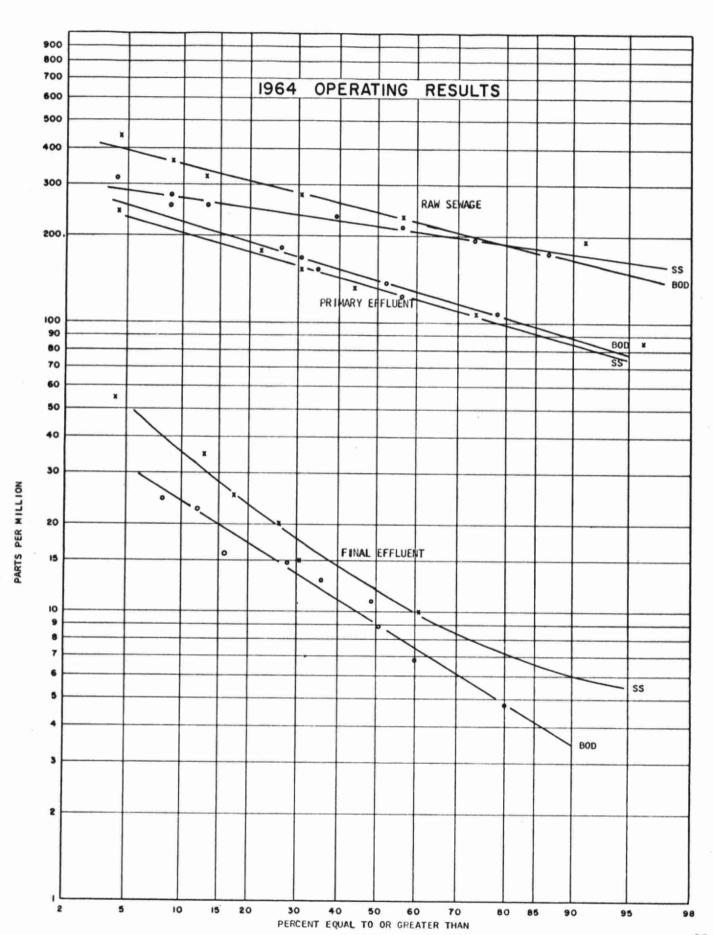
A total of 187.461 million gallons of sewage was treated at the plant in 1964 as compared to 173.024 million gallons in 1963. The average daily flow was 512,000 gallons and represents 77% of the design capacity of the plant. This is an increase of 8.0%. The maximum average daily flow for a month occurred in December, when the flow was 566,000 gallons per day which represents 85% of the design capacity.

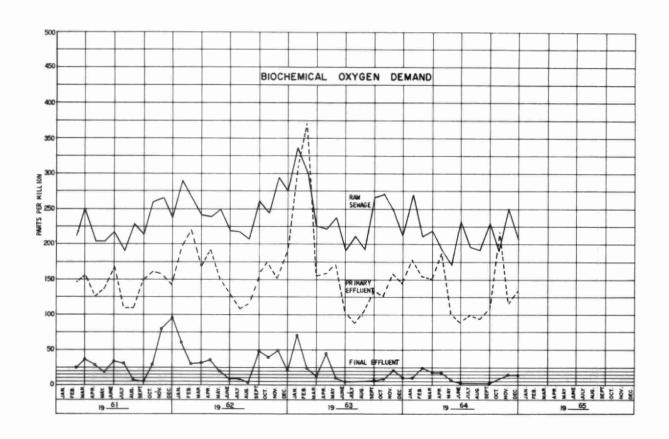




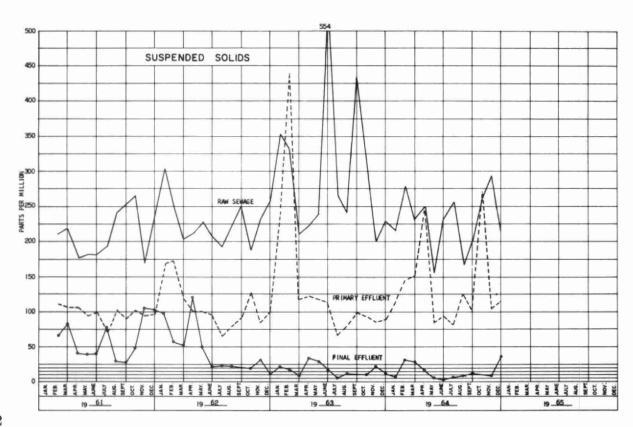
FLOW DATA

Month	Plant Flow (MG)	Average Daily Flow (MGD)	Maximum Daily Flow (MGD)
January	14. 979	. 484	. 576
February	14, 260	. 492	. 560
March	16.408	. 529	. 582
April	16, 308	. 544	. 638
May	16, 591	. 535	. 670
June	14.706	.491	. 528
July	15,000	. 484	• 593
August	17.092	. 551	. 693
September	15, 291	. 510	. 569
October	14.608	.472	. 541
November	14.740	.491	. 549
December	17.578	. 567	. 674
Total	187.461		
Average		. 512	





MONTHLY VARIATIONS



Tale and

GRIT, B.O.D AND S.S. REMOVAL

		θ.	O. D.			S. S.				
MONTH	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT	EFFLUEN P.P.M.	% REDUCTION	TONS REMOVED	GRIT REMOVAL CU. FT.	
JAN.	270	10	96.0	19.5	217	7	96.5	15.7	19	
FEB.	210	24	88.5	13.3	277	31	89.0	17.5	20	
MAR.	217	16	92.5	16.5	231	29	87.5	16.6	22	
APR.	190	16	91.5	14.2	249	16	93.5	19.0	29	
MAY	168	6, 2	96.5	13.4	155	6	96.0	12.4	22	
JUNE	232	2.9	98.5	16.8	234	3	98.5	17.0	17	
JULY	195	3, 2	98, 5	14.4	253	6	97.5	18.5	22	
AUG.	192	3. 2	98.5	16.2	167	8	95.0	13.5	27	
SEPT.	228	3.0	98.5	17.2	198	11	94.5	14.3	20	
ост.	190	8,0	95.5	13.3	261	10	96.0	18.4	21	
NOV.	250	14	94.5	17.4	318	9	97.0	22.8	19	
DEC.	205	14	93.0	16.8	215	36	83.0	15.7	22	
TOTAL				189.0				201.4	260	
AVG.	212	10	95.0	15.7	231	14	94.0	16.8	22	

COMMENTS

A raw sewage having an average strength of 212 ppm in BOD and 231 ppm in SS was treated in 1964. The final effluent had an average strength of 10 ppm in BOD and 14 ppm in SS representing reduction of 95.0% and 94.0% respectively. The final effluent met the OWRC standard of 15 ppm for BOD 75% of the time and the standard of 15 ppm for SS 63% of the time. A total of 189.0 tons of BOD and 201.4 tons of SS was removed during the year.

The primary effluent had an average strength of 136 ppm BOD and 127 ppm SS representing removals of 35.8% and 45.0% respectively.

The above results are based on 8 hour composite samples taken every two weeks.

A total of 260 cu. ft. of grit was removed at an average of 22 cu. ft. per month. This represents a grit removal of 1.4 cu. ft. per million gallons of raw sewage.

AERATION SECTION

MONTH	PRIM. EFFL B.O.D, PPM.	M.L.S.S. P.P.M.	LBS. BOD. PER	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	178	1163	26	1971
FEBRUARY	155	1177	23	2313
MARCH	150	1355	20	2189
APRIL	190	1290	28	1734
MAY	101	1208	15	3387
JUNE	88	1288	12	6011
JULY	97	1251	13	5828
AUGUST	94	1190	16	5308
SEPTEMBER	106	1453	13	4563
OCTOBER	218	1727	21	1903
NOVEMBER	116	1314	16	3772
DECEMBER	134	1401	18	2517
TOTAL				
AVERAGE	136	1318	18	3458

COMMENTS

The average BOD of the primary effluent to the aeration section was 136 ppm and the average mlss was 1318 ppm resulting in an average loading of 18 pounds of BOD per 100 lbs. mlss. An average of 3458 cu. ft. of air was supplied per pound of BOD removed. During the summer a greater quantity of air was used per pound of BOD removed and was due to a lower BOD loading and the continuous operation of two blowers. The final effluent BOD during this time was approximately 3.0 ppm.

DIGESTER OPERATION

	SLUDGE TO DIGESTERS SLUDGE FROM DIGESTERS						
MONTH	1000'S CU.FT.	% SOLIDS	% VOL. MAT.	1000'S CU.FT.	% SOLIDS	% VOL. MAT	GAS PRODUCED 1000'S Cu. Ft.
JAN.	41.0			4.91	3. 37		
FEB.	38.0			4.18	2.19	v	
MAR.	46.0			1.88			
APR.	42.0			10.01			
MAY	44.0			10.02	1, 94		
JUNE	39.0			7.31	2.51		
JULY	40.0			9.20	2,09		
AUG.	46.0			9.61	2,67		
SEPT.	41.0			8, 25	2,01		
ост.	38.0			10.57	2.20		
NOV.	39.0			12, 12	2.03		
DEC.	47.0	3.79	2, 66	10.02	2, 52	1, 51	
TOTAL	501.0			98.08	23, 53		
AVG.	42.0	3, 79	2.66	8, 17	2.35	1.51	

^{*} estimated

COMMENTS

In 1964 an estimated 501,000 cu. ft. of raw sludge was pumped to the digester. A total of 98,080 cu. ft. of digested sludge at an average concentration of 2.35% was hauled and it amounted to 20% of the raw sludge pumped to the digester or 19.4 cu. yd. per million gallons of raw sewage.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	14.979		
FEBRUARY	14.260		4
MARCH	16.408		
APRIL	16, 308		
MAY	16, 591	533 *	4. 34
JUNE	14.706	748	5.08
JULY	15,000	768	5, 12
AUGUST	17.092	787	4, 60
SEPTEMBER	15, 291	793	5, 18
OCTOBER	14,608	109 **	5. 68
NOVEMBER	14.740		
DECEMBER	17.578		
TOTAL	187,461	3738	
AVERAGE	15.622	760	5.00

^{* 23} days chlorination

COMMENTS

The final effluent was chlorinated from May 9 to October 4. A total of 3738 pounds of chlorine was used at an average dosage of 5.00 ppm. The average chlorine residual was 0.5 ppm in the final effluent prior to being discharged into Otter Creek.

^{** 4} days chlorination



CONCLUSIONS

The flow to the plant is approaching the design capacity of the plant. This is indicated by the average daily flow for the year being 77% of the design flow and the average daily flow for the month of December being 85% of the design flow. A good removal was obtained as indicated by a reduction of 95% in BOD and 94% in suspended solids. The project was well operated and maintained.

RECOMMENDATIONS

An immediate study should be made with the purpose of reporting on the need for plant expansion.





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